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(19)

(54) FLOOR SWEEPER WITH AUXILIARY ROTARY BRUSH

(71) We, BISSELL INC., a Corporation organised and existing under the laws of the State of Michigan, United States of America, of Grand Rapids, Michigan 49501, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to floor sweepers, of the type which, in addition to the usual brush roller or rollers, are provided with at least one, and usually two, auxiliary rotary brushes at the front of the sweeper frame for sweeping debris into the path of the brush roller(s).

Such sweepers are almost universally (if incompletely) known as carpet sweepers, although they can of course be used on hard floorings.

According to this invention, there is provided a floor sweeper comprising:

(a) a frame,

(b) means for supporting said frame for reciprocable translation over the floor,

(c) brush roller means extending transversely of the frame,

(d) at least one substantially annular rotatable auxiliary brush disposed at and extending beyond a forward corner of said frame, and with said auxiliary brush being rotatable about an axis for sweeping debris into the path of the brush roller means,

(e) said auxiliary brush being fixed against substantial movement along said axis, and

(f) means mounted beneath said auxiliary brush to deflect the bristles of the auxiliary brush in a direction away from the floor upon the application of downward force to the sweeper to thereby reduce variations in the friction between said auxiliary brush and the floor.

With such an arrangement any undue rotary brush—carpet frictional forces which arise when the sweeper is moved across the floor can be reduced.

The invention will now be described in more detail by way of example with reference to the accompanying drawings, in which:—

Figure 1 is a perspective view of a floor sweeper embodying the invention, and with parts broken away;

Figure 2 is an enlarged fragmentary top plan view of the front end portion of the sweeper, with parts broken away and showing the direction of rotation of the auxiliary brushes when the sweeper is moved forwardly and adjacent a wall;

Figure 3 is an enlarged fragmentary bottom plan view of the front end portion of the sweeper;

Figure 4 is an exploded sectional view of one of the auxiliary brush assemblies;

Figure 5 is a vertical section of one of the assemblies taken on line 5—5 of Fig. 2; and

Figure 6 is a view similar to Figure 5 and showing deformation of the drive ring and bristle deflection upon downward force being applied to the sweeper.

As shown in Figs. 1 to 3 of the drawings, the invention is embodied in a carpet sweeper having a housing or frame 1 which includes side and end walls 2 and 3 respectively, and a top 4. A suitable bail 5 is attached to frame 1 and has the usual handle, not shown. A plurality of supporting wheels 6 are suitably mounted to frame 1 and drive, through any suitable well-known connection, spaced front and rear elongated main brush rollers 7 and 8 which rotate about transverse horizontal axes.

One or more auxiliary brush assemblies are suspended from and extend outwardly beyond the front corners of frame 1 to enable debris to be swept from outboard of the sweeper and inwardly into the path of brush rollers 7 and 8. In the present embodiment, two such assemblies are provided, 9 and 10 respectively, one at each front corner. These assemblies are mounted on the ends of an elongated transverse rigid support plate 11 which is fixedly secured to an inward flange 12 on front end wall 3 and which is disposed on

the underside of the sweeper.

Since both assemblies are structurally identical except for direction of inclination, only assembly 10 will be described in detail.

As best shown in Fig. 4, each assembly 10 comprises a circular brush holding body 13 having a top surface with a flat central bearing portion 14 and an angled peripheral portion 15. Body 13 also includes a flat bottom face 16 and an annular wall 17 which is inclined at about 10° from the axis 18 of a central opening 19 passing through the body 13. The angles shown in the figures are somewhat exaggerated for clarity. For purposes of sweeping the floor, a plurality of circumferentially spaced brush bristle tufts 20 are anchored in wall 17. As shown, tufts 20 are disposed at 90° to wall 17, and thus extend downwardly at an angle of about 10° from a plane 21 passing at right angles through axis 18. The annular array of tufts 20 thus form, with body 13, a generally inverted cup-shaped brush for engaging the floor. The bristle tuft tips are disposed in a further plane 22 which is disposed at 90° to axis 18.

It is also contemplated that brush assembly 10 be driven from within. For this purpose, a drive disc 23 is provided, with disc 23 comprising a flat thin central body portion 24 and a downwardly extending annular peripheral bead or drive ring 25 of greater thickness. Drive disc 23 is contemplated as being of soft flexible resilient rubber-like material, such as polyurethane, and with a Durometer hardness of about 90-Shore A. The surface of disc 23 has a sufficiently high coefficient of friction characteristic, so that ring 25 engages a carpet or smooth floor without slipping.

Referring to Figs. 4 and 5, drive disc body 24 is clamped and held to face 16 of brush body 13 by a rigid annular flange 26 disposed on one end of a tubular bearing 27, with the latter being a press fit or otherwise secured through brush body opening 19 and loosely mounted on axle 30. The sandwich construction thus positions drive ring 25 so that it is coaxial with and disposed radially inwardly of the brush bristle tips, at a point intermediate the bristle tips and the pivot axis 18. As shown in Fig. 5, ring 25 extends radially outwardly from brush body 13 and is disposed adjacent the inner end portions of bristle tufts 20 and closely beneath the tufts.

Drive ring 25 is fixed relative to tufts 20, and is contained in a fixed plane 28 which is parallel to plane 22.

The auxiliary corner brushes 9 and 10 rotate in a direction opposite from previously known brushes of this type, so that they will flick or whisk the debris into the path of the brush roller or rollers, and yet will operate continuously against a wall and without stalling. As best shown in Fig. 5, brush assembly 10 is mounted on a fixed axis 29 which is inclined substantially from the vertical. Axis 29 coincides with axis 18 and is defined by a downwardly extending axle 30 which is secured to a bent end portion 31 of support plate 11, as by riveting. The inner end portion of axle 30 is flanged to provide a bearing surface, as at 32. Portion 31 is bent so that axle 30 is inclined downwardly and inwardly transversely of sweeper frame 1, i.e. the axles 30 are "toed" inwardly. An angle of inclination from the vertical of 12° to 16° has been found to be very satisfactory. Bearing 27 is mounted over axle 30 by a holding screw 33 which is tightened so as to permit free brush rotation but prevents any substantial axial shifting of the brush, brush body top surface portion 14 being engaged with axle flange 30.

Referring to Figs. 2 and 5, when the sweeper is moved forwardly over the floor, drive ring 25 on the underside of the auxiliary brushes will engage the floor and drive right front brush assembly 10, for example, clockwise by friction. The fixed angle of brush inclination will cause the outer side brush bristles to whisk debris first rearwardly and then inwardly between front wall 3 and brush roller 7.

Some of the dust and debris will be directed outwardly of the sweeper before being returned inwardly by the auxiliary brushes. Furthermore, as best shown in Fig. 2, when the sweeper is moved along a wall 34, the bristles of brush assembly 10 may deform against the wall but will continue to rotate and perform the desired function, because the brush tends to roll along the wall, and may thus in part be driven by engagement with the wall.

Downward forces on the sweeper will not cause the brush bristle tips of the auxiliary brushes to dig into the carpet, even though the brush is fixed against axial movement. This is accomplished by the flexibility of drive disc 23. Referring to Fig. 6, downward force on the sweeper will cause the outer transverse disc portion to deform upwardly into engagement with the inner end portions of the tufts 20 disposed directly above. This action will, in turn, deflect the tufts in a direction away from the carpet, but not out of contact therewith. The greater the downward sweeper force, the greater will be the upward disc deformation and brush deflecting action, thus maintaining the frictional forces between the brush and carpet substantially constant. The result is that the force required to push the sweeper will increase very little, if at all, as the downward force applied by the user is increased.

The auxiliary brush assembly disclosed herein is constructed in a manner which is simpler and less expensive than prior known

devices, but is made in such a way that, even with an internal drive, it will not stall, even against a wall, and a cleaner equipped with such an assembly will be easier to push.

Attention is drawn to the claims of our Application No. 25109/76, Serial No. 1,547,285 out of which this application is divided.

WHAT WE CLAIM IS:—

1. A floor sweeper comprising:

(a) a frame,

(b) means for supporting said frame for reciprocable translation over the floor,

(c) brush roller means extending transversely of the frame,

(d) at least one substantially annular rotatable auxiliary brush disposed at and extending beyond a forward corner of said frame, and with said auxiliary brush being rotatable about an axis for sweeping debris into the path of the brush roller means,

(e) said auxiliary brush being fixed against substantial movement along said axis, and

(f) means mounted beneath said auxiliary brush to deflect the bristles of the auxiliary brush in a direction away from the floor upon the application of downward force to the sweeper to thereby reduce variations in the friction between said auxiliary brush and the floor.

2. A floor sweeper according to claim 1, in which said brush deflecting means comprises: a flexible member engageable with the floor and movable upwardly into engagement with the said brush bristles when downward force is applied to the sweeper.

3. A floor sweeper according to claim 2, in which said flexible member comprises means to rotatably drive said auxiliary brush about said axis upon reciprocable translation of the frame.

4. A floor sweeper according to claim 3, in which said flexible member comprises a friction drive ring mounted in the undeflected condition coaxially with said auxiliary brush and disposed closely adjacent the bristles thereof.

5. A floor sweeper according to claim 4, in which said axis is fixed relative to the frame and inclined downwardly and transversely inwardly of the frame so that said ring and brush are inclined to the vertical whereby the outer transverse edge portions of said ring and brush engage the floor while the inner transverse edge portions thereof are disengaged therefrom, the construction being such that upon forward movement of said sweeper, said auxiliary brush rotates to whisk debris behind itself and into the path of said brush roller means.

6. A floor sweeper according to claim 5 in which the angle of inclination of said axis to the vertical is 12°—16°.

7. A floor sweeper according to claim 4:

(a) in which said brush bristles are rooted in the edge of a brush body,

(b) in which said drive ring forms the peripheral portion of a drive disc, and

(c) which includes means to clamp said drive disc to said brush body so that said drive ring extends radially outwardly from the brush body.

8. A floor sweeper according to claim 7, in which said drive ring is disposed adjacent the inner end portions of the bristles of said brush.

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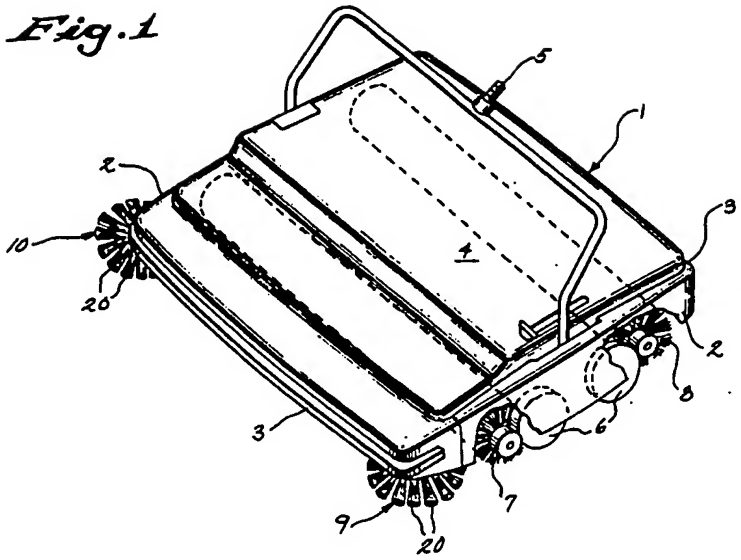
3 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheet 1

Fig.1



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Sheet 2

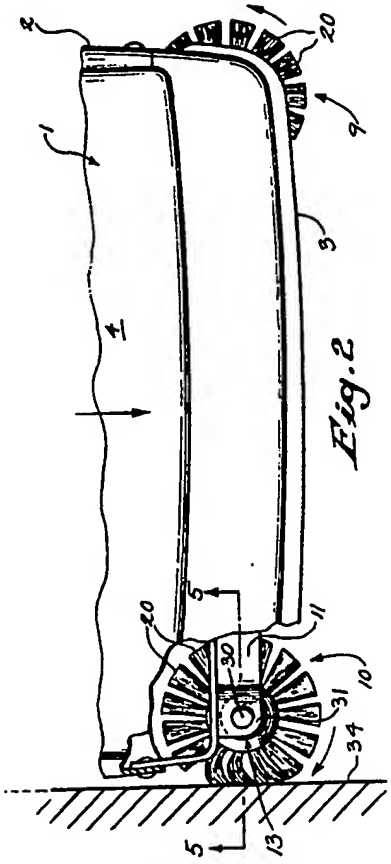

Fig.2

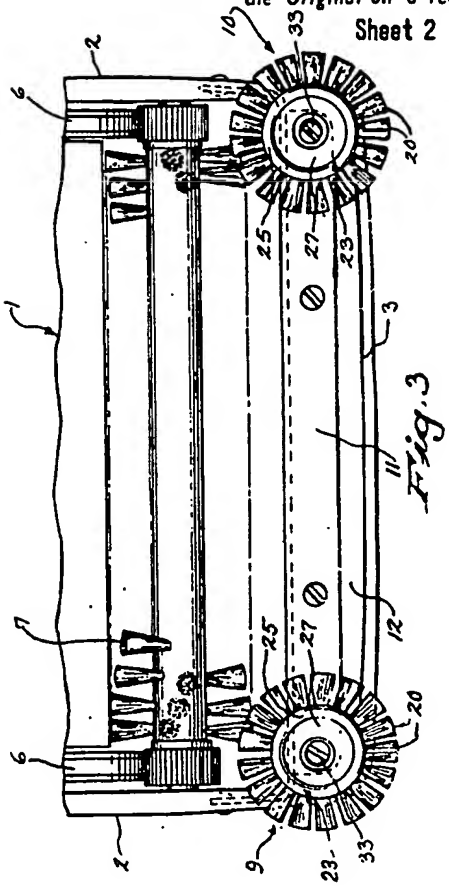

Fig.3

1547286 COMPLETE SPECIFICATION
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Sheet 3

Fig.4

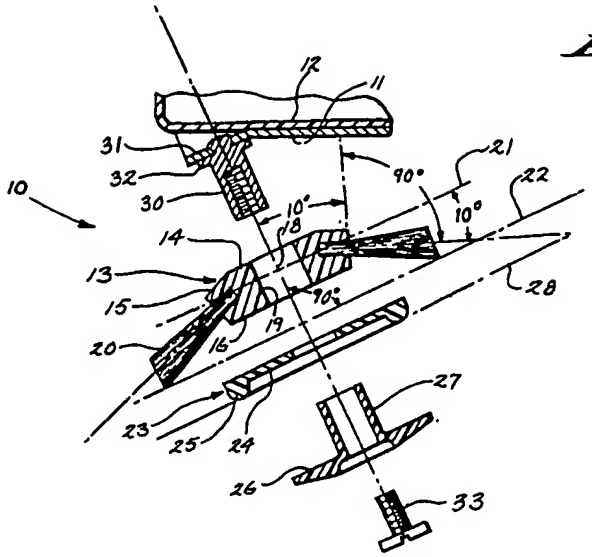

Fig.5

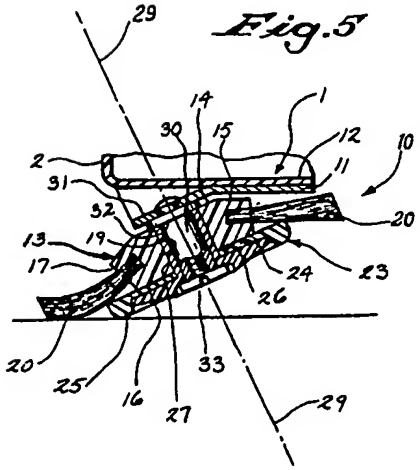

Fig.6